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Germination of Red Alder Seed

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Abstract

Red alder seeds were collected from six different locations throughout the natural range of the species. Each seed lot was obtained from a single tree, and the seeds were used to determine germination with and without stratification treatment. Irrespective of treatment, germination varied significantly ($P \leq 0.01$) by seed lot; it ranged from 59 to 87 percent. Rate of and capacity for germination, however, were not enhanced by stratification. Mature red alder seeds do not require stratification for prompt germination after sowing.

Keywords: Germination (seed), stratification (seed), red alder, Alnus rubra.

Introduction

Red alder, Alnus rubra Bong., is the most important hardwood in the Pacific Northwest and coastal Alaska. It has a natural range, in the Pacific coast region, extending from southeastern Alaska to western British Columbia, and south through Washington, northern Idaho, and western Oregon to Santa Barbara in southern California (Worthington 1965). Alder is a pioneer species with a significant role in soil development. It is now being used in the rehabilitation of mine spoils; and because of its N_2-fixing ability, it has been suggested as a biological means to supplement or replace synthetic N fertilizers in admixtures and alternate cropping systems with other species (Tarrant and Trappe 1971). Utilization of red alder for wood, fiber, and energy has also been increasing in recent years. Demand for alder planting stock, therefore, is likely to become much greater in the near future.

Production of silviculturally acceptable planting stock depends upon thorough knowledge of requirements for seed germination and culture of resulting young seedlings in the nursery or greenhouse. Although the literature shows no specific requirement for any pregermination treatment (Mirov and Kraebel 1939, Schopmeyer 1974), a recent survey showed that 30 percent of the nurserymen and foresters questioned stratify red alder seeds before sowing (results of questionnaire summarized by D. S. DeBell and C. A. Harrington, on file at Forestry Sciences

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Laboratory, Olympia, Wash.). This study, therefore, was designed to determine if stratification is required for prompt and uniform germination of red alder seed. We used six different seed lots and stratified the seeds for various periods of time.

Materials and Methods

The seeds.--Six different seed lots were used, and each lot was obtained from a single tree. Pertinent information concerning the six parent trees is as follows:

Location	Site elevation (m)	D.b.h. (ob) (cm)	Height (m)	Age (yrs)
Auks Bay, Juneau, Alaska	0	30.5	12.2	20
Telegraph Cove, Vancouver Island, B.C., Canada	0	21.6	17.1	26
Wind River, Carson, Wash.	488	13.7	9.4	14
Taylor Creek, Grants Pass, Oreg.	457	15.2	12.2	18
Little River, Arcata, Calif.	305	32.5	19.1	25
King City, Calif.	287	40.6	9.1	25

Ripe strobiles were collected in late fall 1977 and early winter 1978 and shipped to Olympia. In the laboratory, strobiles were airdried at room temperature, and the seeds were mechanically extracted by rubbing and cleaned by screening. Seeds were packed in plastic bags and stored dry in a refrigerator until used for germination tests in late 1978.

Stratification.--Seeds, enclosed in nylon netting, were soaked in distilled water for 24 hours at room temperature. Seeds were then drained of excess water, transferred to sealed plastic vials, and placed in a refrigerator at 2° to 5°C. Stratification periods were 0, 1, and 2 months; and times at which stratification was begun was scheduled so all treatments were completed the same day.

ollowing stratification, seeds were placed
in 1-cm plastic petri dishes on one circle
er paper moistened with 5 ml of distilled
added during the test as needed. There
licates for each seed lot. Dishes were
incubator programed for alternating
f 30°C for 10 hours and 20°C for
scent light available during the higher
of radicle was used as the criterion for
inants were counted every week for 4 weeks.

ere calculated. Final cumulative
subjected to analysis of variance after
n.

Results and Discussion

Cumulative germination percents of the various seed lots, with and without stratification, are shown in table 1. All seed germinated quickly, regardless of treatment or seed source. Averaged over all seed lots and treatments, almost 96 percent of the total germination had occurred at 5 days. At that time and at subsequent dates until the end of the germination test, there were only a few minor increases in germination of some lots as stratification increased. Stratification, therefore, did not increase rate of germination.

Table 1. Cumulative germination percents of red alder seeds after stratification for different periods of time[1/]

Seed lot source	Stratification period (months)	Days in germination test			
		5	11	18	29
Juneau, Alaska	0	81	85	86	86
	1	80	83	84	84
	2	88	89	90	90
				Average	87
Vancouver Island, B.C., Canada	0	66	66	68	68
	1	65	65	66	66
	2	64	66	66	66
				Average	67
Carson, Wash.	0	54	56	57	57
	1	54	55	55	55
	2	63	64	64	64
Grants Pass, Oreg.	0				
	1				
	2				
Arcata, Calif.	0				
	1				
	2				
King City, Calif.	0				
	1				
	2				

[1/] Percents are averages of f

Irrespective of stratification treatment, germination significantly ($P \leq 0.01$) varied by seed lot. Differences among lots, however, were probably caused by differences between locations and by tree-to-tree variations at each location. Average final germination was highest (87 percent) with the Juneau seed and lowest (59 percent) with the Carson source. Probably, the lower germination percents were, at least in part, due to a higher proportion of empty seeds which are known to occur often in red alder. In fact, most of the seed used in this study had higher germination than has usually been observed in our laboratory or reported by others (Mirov and Kraebel 1939, Schopmeyer 1974).

Final germination of each of the six seed lots was not significantly ($P \leq 0.05$) increased by stratification. Stratification for 2 months, however, reduced germination of the seeds from Grants Pass. This was probably caused by deterioration of seed embryos during the long period of moist chilling. Apparently, the seeds from Grants Pass were more sensitive than those from other sources to attacks by fungi which were observed on the thin, papery seedcoats.

Clearly, our data show that rate of and capacity for germination were not improved by stratification. Mature red alder seeds, therefore, should be sown without stratification.

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